14

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Type I Progress Report No. 7
December 1973 - January 1974

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a. Title. The Interdependence of Lake Ice and Climate in Central North America

b. Proposal Number. 113

c. GSFC ID Number. P506

d. Problem Areas. None.

e. Accomplishments. The third biannual progress report for this investigation was prepared during December; a summary of the 1972 freeze season was presented accompanied by significant correlations with climatological data. Analysis of ERTS 1 imagery from the 1973 thaw season proceeded in an orderly fashion. To date all imagery up through mid May 1973 have been viewed and analyzed.

f. Projected Work. During the next bi-monthly reporting period, analysis of ERTS 1 imagery for the 1973 thaw season will be completed. In addition, comparative analysis with available meteorlogical data is scheduled to begin.

g. Results. The positions of the thaw transition zone during mid-March 1973 have been reported previously [1,2]. Besides the thaw transition zone, the imagery displayed features which enabled analysts to discriminate between lakes that were solidly frozen over and those that had begun to thaw. These early thaw features included: loss of snow cover, open features, fracture swarms, shoreline open water, open water at inlets and outlets, a mottled ice surface, and varying reflectances from the surface. The line separating the two lake ice surface conditions was called the "ice decay boundary" (IDB).

Relative positions of the transition zone and the IDB for the months of March and April 1973 are shown in Figures 1, 2 and 3. The thaw transition zone displays two apparent trends during these months: (1) the zone is oriented northwest-southeast, and (2) the zone tends to become narrower

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towards the west. The first of these observations is consistent with a similar trend noted during the freeze season [3]. In the case of the thaw season, however, a sizable portion of this trend may be the result of day to day thawing proceeding in a westerly direction with the track of the satellite. The second trend is opposite that observed for the freeze season; on the whole the thaw transition zone is considerably narrower than the freeze transition zone.

A difference in the northward migration rate along the thaw transition zone is apparent from a comparison of Figures 1 with 2 and 2 with 3. During the period the transition zone east of 100° W longitude migrated much more rapidly than portions of the zone to the west. Regional variations in climatology could have been the cause, however, no evidence supporting this conclusion has yet been developed.

In contrast to the fairly consistent and regularly varying thaw transition zone, the ice decay boundary displays some unusual trends. Of particular interest are the breaks or discontinuities in the trace of the IDB, notably west of 100° W longitude (Figures 1-3). These breaks are apparently real and denote a day to day change in the ice condition of the lakes near the IDB. Recall that at the latitudes involved considerable sidelap occurs between ERTS swaths --- hence, consecutive day ice observations are possible for many lakes. These observations imply a rapid northerly migration of the IDB, quite possibly due to an intense early spring warming period.

Whereas the NW-SE trend of the IDB generally parallels that of the transition zone, the migration rates of the two features are essentially opposite. Exceedingly rapid migration west of 100° W longitude (Figures 1 and 2) is contrasted by little or no latitudual movement in the east. (Figures 2 and 3). Again, regional differences in climate may have been the cause, but other explanations are possible.

Interpretations based upon the data presented thus far would be premature and inappropriate at this time. However, the general trends in the observations are certainly real, and they will be discussed in greater detail in a later report.

References

1. Wolf Research and Development Corporation, Type I Report No. 6, NASA Contract NAS 5-21761, October 10, 1973.

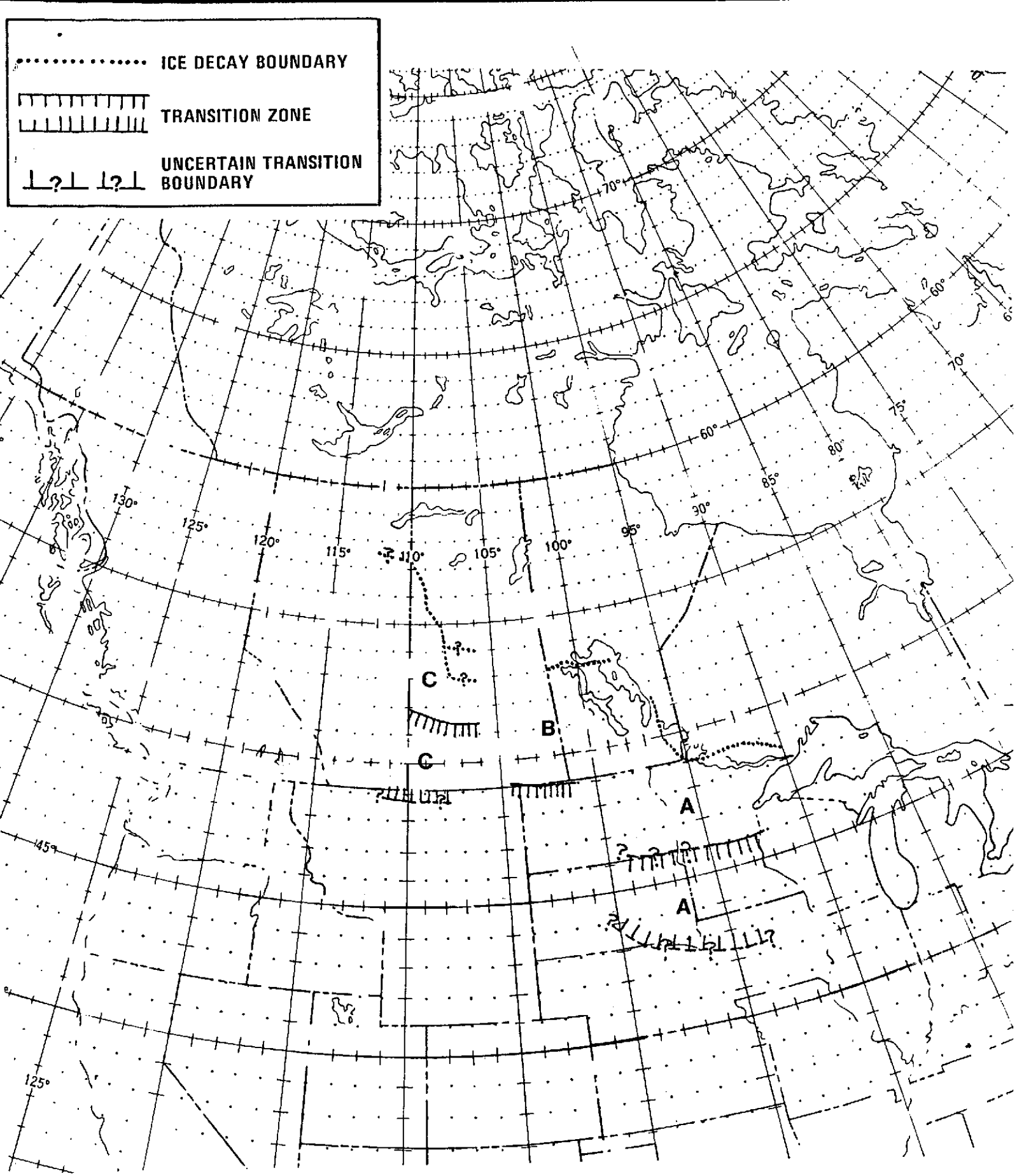

FIGURE 1. THAW TRANSITION ZONE BOUNDARIES AND ICE DECAY BOUNDARIES FOR MARCH 1973. PERIODS OF OBSERVATION:

A. 16 MAR – 21 MAR
B. 24 MAR – 26 MAR
C. 29 MAR – 02 APR

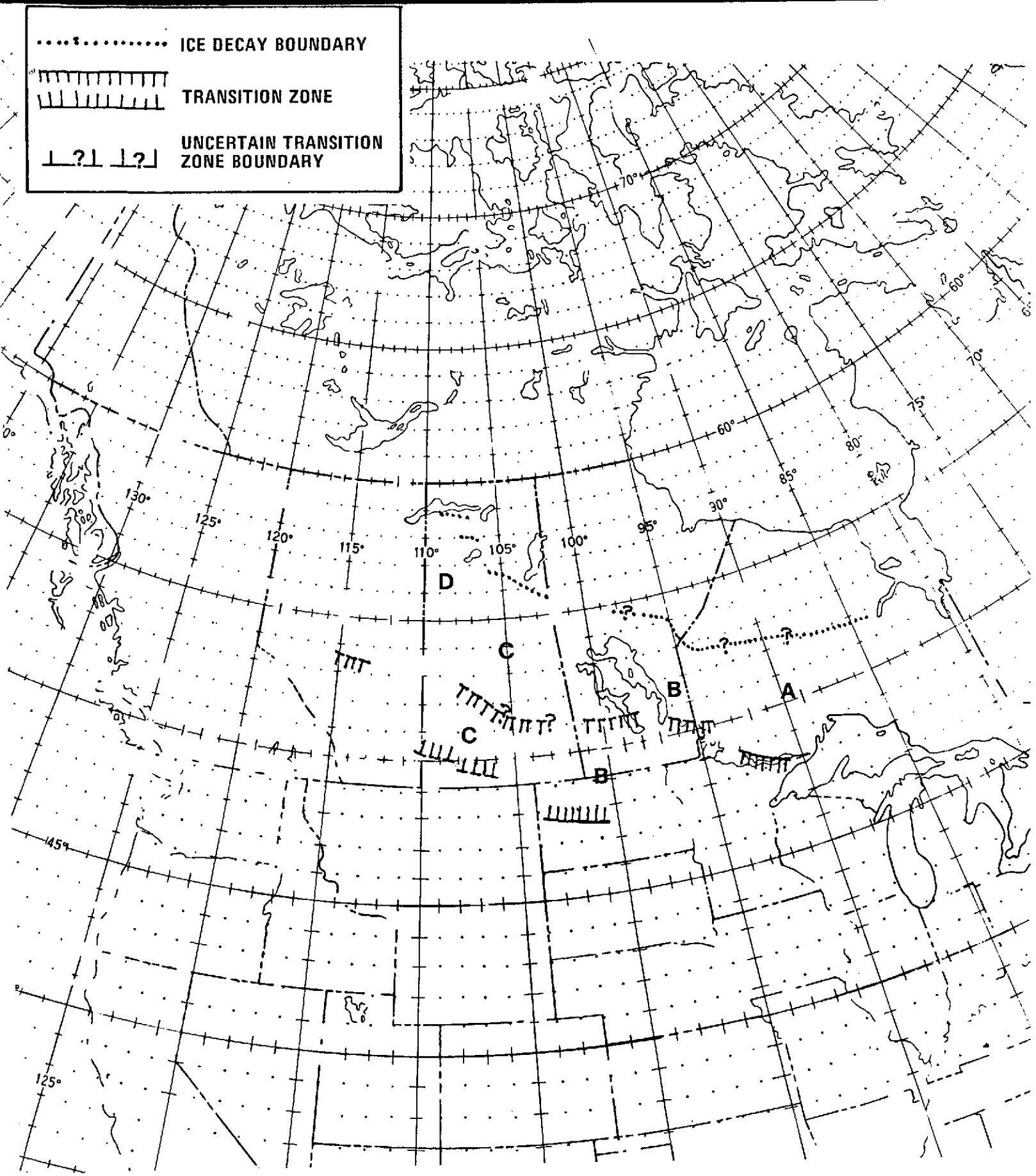

FIGURE 2. THAW TRANSITION ZONE BOUNDARIES AND ICE DECAY BOUNDARIES FOR EARLY APRIL 1973. PERIODS OF OBSERVATION:

A. 30 MAR – 04 APR
B. 07 APR – 10 APR
C. 12 APR – 16 APR
D. 18 APR – 21 APR

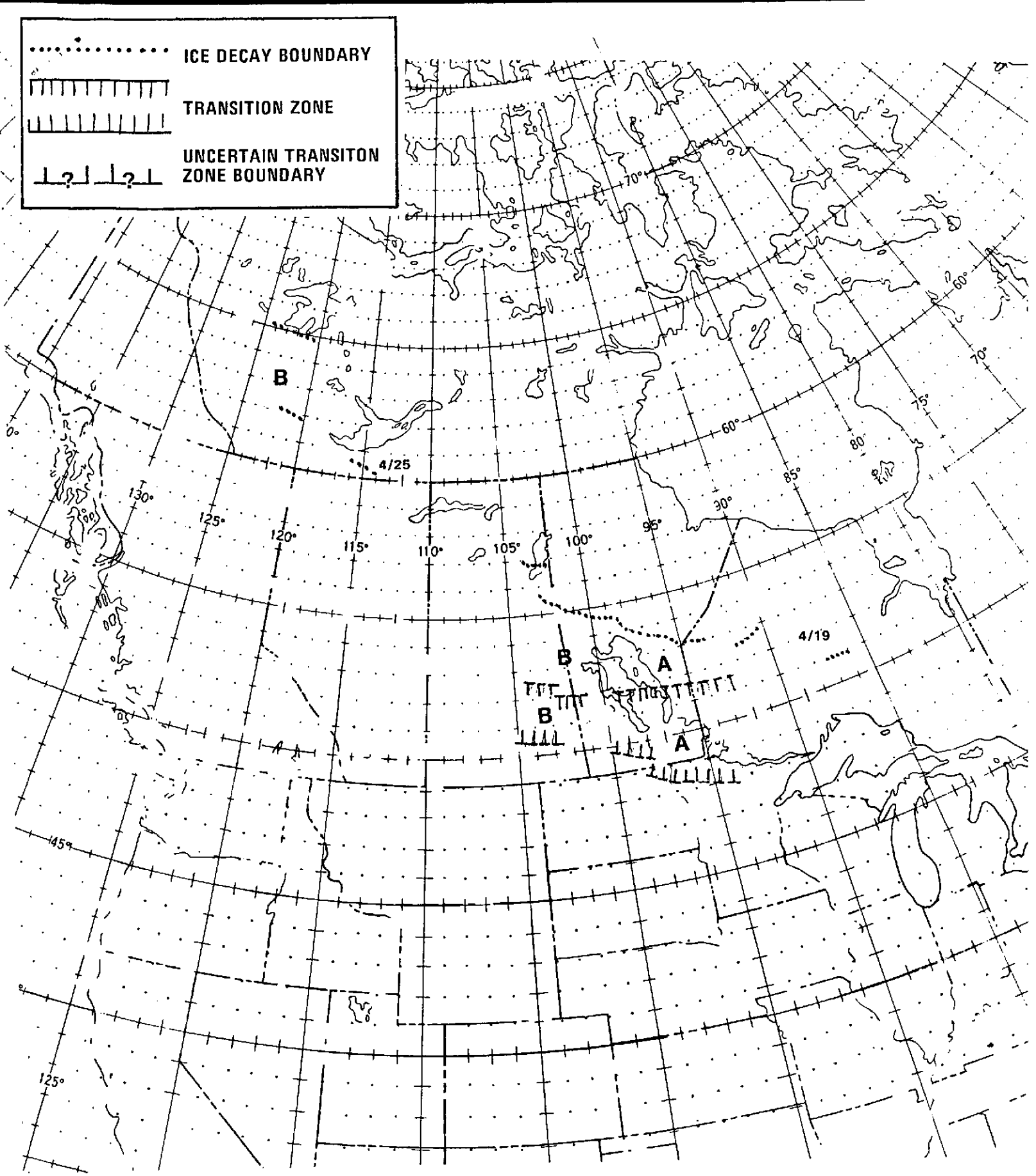

FIGURE 3. THAW TRANSITION ZONE BOUNDARIES AND ICE DECAY BOUNDARIES FOR LATE APRIL 1973. PERIODS OF OBSERVATION:

A. 23 APR – 27 APR
B. 29 APR – 02 MAY

2. Jelacic, A.J., The Interdependence of Lake Ice and Climate in Central North America, Interim Report June-November, NASA Contract NAS 5-21761, 27p., 1973.

3. Jelacic, A.J., The Interdependence of Lake Ice and Climate in Central North America, Interim Report, 29p., NASA Contract NAS 5-21761, 1973.

h. Publications. None.

i. Recommendations. None.

j. Standing Order Form Changes. None. Standing order due to expire after all imagery taken as of 4 January 1974 has been received.

k. Data Request Forms. One, dated 4 January 1974

l. Image Descriptor Forms. None.